



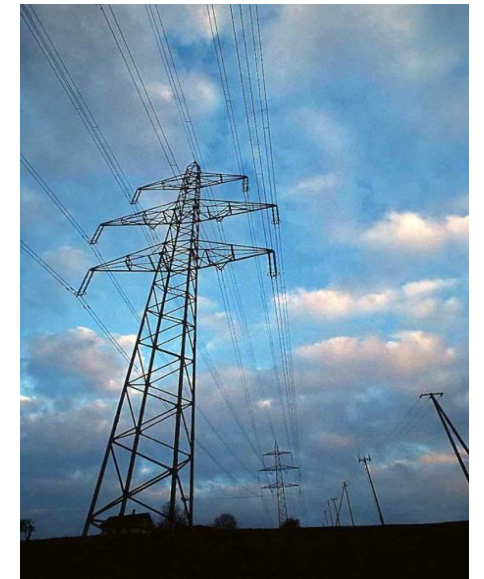
Increased Electric Dependence and Resilience: A Match Made in Heaven or a Train Wreck Ahead?



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The United States Grid Security Model

- EPACT 2005: Congress subjects all ‘users of the bulk electric system’ to mandatory reliability standards, including cybersecurity standards
- Standards set by industry organization (NERC) but subject to approval by the federal regulator (FERC)
- Standards initial focus was reliability but have expanded to physical and cyber-security
 - CIP 14 Critical Transmission Facilities
 - Cybersecurity Plans
 - Supply Chain Management



The United States Grid Security Model (continued)

- **Electric Distribution System Security:** State regulated, largely left to individual utility.
- **Gas Pipeline Infrastructure:** Voluntary industry-driven guidelines, regulation by Transportation Security Administration
- **Tri-furcated Model:** Minimal upstream reach



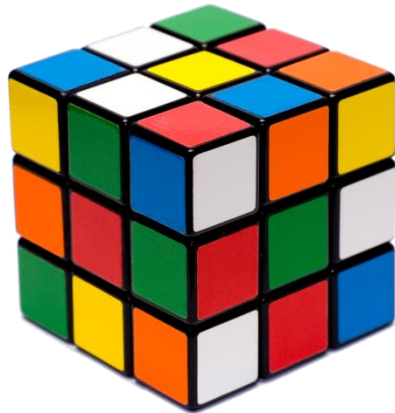
Emerging threats and various degrees of control/self-help:

- **Cybersecurity:** Identification of assets, auditing, upstream supply chain procurement practices;
- **Geomagnetic Disturbances:** FERC Requirement for vulnerability assessments and mitigation to ensure steady state performance for “one in 100 year event”;
- **Electro-magnetic Pulses:** FERC declines to issue standard due to need for additional analysis of appropriate protection measures;
- **Natural events:** Super-storms Sandy and Irma, drought conditions etc.



Today's Latest Discussion:

Resilience: An actionable goal or a new fad?



Reliability vs. Resilience

- **Reliability:** “Operating the elements of the bulk-power system] within equipment and electric system thermal, voltage, and stability limits so that instability, uncontrolled separation, or cascading failures of such system will not occur as a result of a sudden disturbance, including a cybersecurity incident, or unanticipated failure of system elements”
- **Resilience:** “Resilience is preparing for, operating through and quickly recovering from a high-impact, low-frequency event”

Resilience Planning

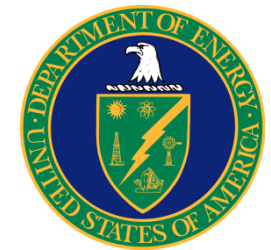
- What to plan for? Actionable threats? Remote threats?
- The line between prudent planning vs. gold plating?
- Differing customer requirements on resilience
 - Is the goal to empower customers through self-help vs. utility offerings?
 - Should resilience be targeted to certain customers?
 - Re-define universal service to ‘raise the bar’ for all or focus on customers willing to pay for more ‘resilient’ service?
 - Free riders given the interconnected nature of the grid?



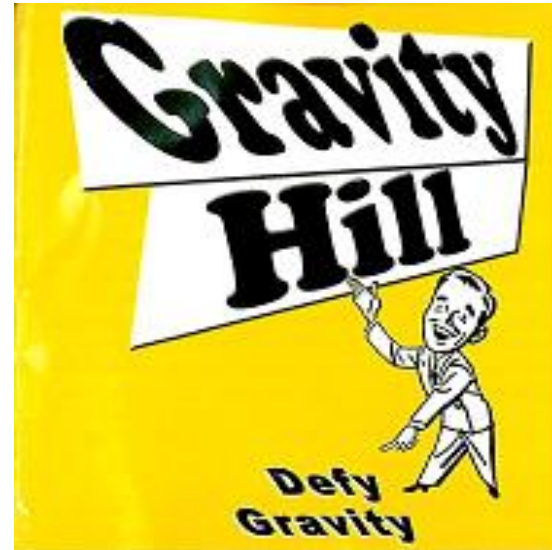
An Added Complication: **Who Decides?**



- **States:**
 - State Energy Policies: Governors/legislators
 - State PUCs
 - State Emergency Management agencies?
- **FERC**
- **Department of Homeland Security/FEMA**
- **Department of Energy**
- **Congress**
- **International Consensus**



“Hanging in mid-air”: a dangerous place





LET'S TALK...

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